Essays in macroeconometrics

Inaugural-Dissertation
zur Erlangung des akademischen Grades eines
Doktors der Wirtschafts- und Sozialwissenschaften
der Wirtschafts- und Sozialwissenschaftlichen Fakultät
der Christian-Albrechts-Universität zu Kiel

vorgelegt von
Mag.rer.soc.oec.

Martin Plödt

aus Weiden i.d.OPf.

Kiel, 2016

Gedruckt mit Genehmigung der
Wirtschafts- und Sozialwissenschaftlichen Fakultät
der Christian-Albrechts-Universität zu Kiel

Dekan: Prof. Dr. Achim Walter
Erstbegutachtung: Prof. Dr. Helmut Herwartz
Zweitbegutachtung: Prof. Dr. Kai Carstensen
Drittbegutachtung: Prof. Dr. Carsten Trenkler

Tag der Abgabe der Arbeit: 19.11.2015
Tag der mündlichen Prüfung: 20.05.2016

Acknowledgments

I wrote this dissertation while I was employed at the Forecasting Center of the Kiel Institute for the World Economy and the Institute for Statistics and Econometrics at Kiel University. During this time I have benefited enormously from discussions and exchange of expertise with numerous colleagues. I am indebted to my first supervisor Helmut Herwartz for his guidance and support throughout the entire time, often answering e-mails within minutes any time of day. I would like to thank Kai Carstensen, Stefan Kooths, and Joachim Scheide for creating an extremely friendly and pleasant atmosphere at my workplaces at the Kiel Institute and Kiel University and for countless discussions, in which I have always learned a little bit more about economics. I am very grateful to my co-authors, colleagues, and friends Claire Reicher, Jens Boysen-Hogrefe, Nils Jannsen, Tim Schwarzmüller, and Björn van Roye. Last but definitely not least, I am incredibly indebted to my parents, who have supported me in every respect and to Esther for the wonderful time I always spend with her, no matter where we are.

Contents

Outline

This dissertation presents four essays in macroeconometrics. The four essays cover various macroeconomic topics as well as various econometric methods. Their common denominator is a data-driven view on macroeconomic relations and policies.

The essays can be grouped into two thematic blocks. The first block (essays 1 and 2) focuses on two recently proposed statistical identification approaches for structural vector autoregressive models and applies them to the analysis of US monetary policy and the global crude oil market, respectively. The second block (essays 3 and 4) deals with fiscal policy in the euro area. It considers the degree of stabilization and consolidation policy that euro area governments have historically pursued. Moreover, it considers the design of fiscal policy rules and their medium-run effects on public debt and primary surpluses under different scenarios.

In what follows, I provide a more detailed summary of the individual essays, including their motivation and main results as well as information about publication and co-authorship.

Essay 1 is entitled "Simulation evidence on theory-based and statistical identification under volatility breaks". It is joint work with Helmut Herwartz and is published in the *Oxford Bulletin of Economics and Statistics*.[1] In this study we address the issue of identification in structural vector autoregressive (SVAR) models. SVAR modeling has become one of the most widely used tools in empirical macroeconomics. In particular, we assess the relative merits of a statistical identification approach that exploits changes in second order moments of systems of time series and alternative, more theory-based identification approaches. In order to do so, we first subject all identification approaches to a simulation-based comparison. Our simulation setup allows investigating the circumstances under which the statistical approach might be feasible, the accuracy of impulse response patterns resulting from different identification approaches, as well as potential biases that may arise as a consequence of an omitted variable. In a next step, we then investigate if and how an analyst can make use of information from both statistical and theory-based identification approaches in the context of a low-dimensional model of US monetary policy. We show that combining information from various approaches allows evaluating common theory-based restrictions, economically interpreting the more precise responses resulting from the statistical approach, and detecting

[1] See Herwartz and Plödt (2016a).

general deficiencies of the structure and specification of the chosen empirical model.

The main text is accompanied by an extensive appendix, in which we discuss the data generating processes and some simulation results in more detail. This appendix is also published as supporting information to our article on the journal's website.[2]

Essay 2 is entitled "The macroeconomic effects of oil price shocks: Evidence from a statistical identification approach". It is again joint work with Helmut Herwartz and is forthcoming in the *Journal of International Money and Finance*.[3] In this study we investigate the dynamics in the global crude oil market and the macroeconomic effects of different oil price shocks. A proper understanding of the effects of oil price shocks is crucial for the optimal conduct of fiscal and monetary policy, especially in times of a sharp rise or fall in oil prices. Our analysis is again based on a SVAR model. Identification of the model, however, is now achieved by presuming that the reduced form residuals can be traced back to structural shocks that are independently distributed over the cross equation dimension. We find that the results based on our identification approach are remarkably similar to the results of several other recent studies on oil market dynamics even though they rely on statistical arguments instead of a set of theory-based a priori restrictions. We then go on to investigate the cumulative contributions of different oil shocks on the real price of oil, focusing in particular on the rapid fall in oil prices at the end of 2008 and the end of 2014. Our results suggest that the main triggers of the fall in oil prices in these two periods were weak global demand and a reduced precautionary demand for oil, respectively. Finally, we analyze the effects of oil supply shocks, aggregate demand shocks, and oil-specific demand shocks on macroeconomic aggregates in three major economic areas, namely the US, the euro area and China. Consistent with previous studies we find that different oil price shocks have distinct macroeconomic effects. Moreover, we find that overall, the macroeconomic effects of oil price shocks in the US are more similar to the euro area than to China.

Essay 3 is entitled "Estimating fiscal policy reaction functions: The role of model specification". It is joint work with Claire Reicher and is published in the *Journal of Macroeconomics*.[4] In this study we aim at investigating the actual degree of counter-cyclical stabilization policy or consolidation in response to the debt ratio that euro area governments have historically pursued. This is important as the crisis in the euro area, the desire for macroeconomic stability, and the need to consolidate public finances have provoked a renewed discussion about the positive systematic conduct of fiscal policy as well as the design of normative fiscal policy rules. The literature, however, has not yet come to a consensus on the actual responses of fiscal policy to output and to past public debt levels within in-

[2]See http://onlinelibrary.wiley.com/doi/10.1111/obes.12098/suppinfo.
[3]See Herwartz and Plödt (2016b).
[4]See Plödt and Reicher (2015).

dustrialized countries. We show that this lack of consensus may be due to the way in which the time-series literature has typically handled the issue of autocorrelation, in a way which is incompatible with the timing of automatic stabilizers. In order to find a way around this problem, we formulate and estimate a set of fiscal policy reaction functions for the euro area, which allow for the primary surplus to feature three components: a fast-moving (stabilizing) response to the output gap, a consolidating response to the debt-GDP ratio, and an exogenous, persistent fiscal policy shifter. When we formulate a fiscal reaction function in this way, our estimates are compatible in magnitude with previous estimates from the cyclical adjustment literature. Furthermore, based on a set of model comparison exercises in line with what has been done in the monetary policy literature, we argue that our specification explains the data better than the more commonly used specification. Based on these findings we go on to analyze how the systematic conduct of fiscal policy has changed over time and analyze the role of high debt levels, asymmetric reactions to the output gap, and data revisions.

Essay 4 is entitled "Primary surplus and debt projections based on estimated fiscal reaction functions for euro area countries". It is again joint work with Claire Reicher and is published in the *Revue de l'OFCE*.[5] In this study, we project the path of public debt and primary surpluses for a number of countries in the euro area under a fiscal rule based on a set of estimated fiscal policy reaction functions. Our fiscal rule represents a fiscal analogue to a well-known monetary policy rule, and it is calibrated using country-specific as well as euro area-wide parameter estimates. We then forecast the dynamics of the fiscal aggregates under different convergence, growth, and interest rate scenarios and investigate the implications of these scenarios in projecting the future path of fiscal aggregates. Our forecasts aim at delivering an insight into the medium-run effects of this particular type of a fiscal rule and at providing some early warning of future fiscal pressures according to the desired degree of fiscal consolidation. This is important since fiscal consolidation itself has macroeconomic effects. In addition, the forecasting methodology that we set up in this study may also serve as a framework to analyze the effects of other types of fiscal rules.

As the four essays are based on joint work with different co-authors, I briefly describe my contribution to each essay in the last part of this outline.

Essay 1 is joint work with Helmut Herwartz and the result of extensive discussions between the two of us. Helmut Herwartz came up with the idea to compare different identification approaches by means of a simulation experiment. The technical implementation, simulation, analysis, and most of the writing were done by myself.

Essay 2 is also joint work with Helmut Herwartz. Given his current work on the method, he proposed to apply the non-Gaussian framework of independent shocks to recent macroeconomic topics. Against the background of the recent decline in oil prices, I suggested to

[5] See Plödt and Reicher (2014b).

employ this approach for an investigation of the dynamics in the global crude oil market. We both contributed to the software code. Interpretation of the results and most of the writing were done by myself.

Essay 3 is joint work with Claire Reicher. It evolved from a short empirical exercise with the goal to provide some ideas on how to calibrate fiscal rules to a multi-year research project. As the study is the final result of countless discussions and several revisions, it is almost impossible to disentangle our individual contributions. However, I significantly contributed to the conceptual ideas and calculations, as well as to the writing of the paper.

Essay 4 is also joint work with Claire Reicher. Following the proposal by Snower et al. (2011), we aimed at exploring a number of different scenarios regarding the future path of fiscal policy using a simple and flexible fiscal rule, based on the past behavior of fiscal policy. We calibrated the fiscal rule using the estimates presented in a previous version of Essay 3 (cf. Plödt and Reicher, 2014a). Again, it is impossible to exactly tell apart individual contributions, but the work on the technical part and the writing was shared roughly equally.

ESSAY 1

Simulation evidence on theory-based and statistical identification under volatility breaks

Abstract

Beside a priori theoretical assumptions on instantaneous or long-run effects of structural shocks, sign restrictions have become a prominent means for structural vector autoregressive (SVAR) analysis. Moreover, changes in second order moments of systems of time series can be fruitfully exploited for identification purposes in SVARs. By means of Monte Carlo studies, we examine to what degree theory-based and statistical identification approaches offer an accurate quantification of the true structural relations in a standard model for monetary policy analysis. Subsequently, we discuss how identifying information from theory-based and statistical approaches can be combined on the basis of a low-dimensional empirical model of US monetary policy.

JEL classification: C32, E47.
Keywords: Vector autoregression, identification, sign restrictions, volatility, simulation.

This study is joint work with Helmut Herwartz.

ESSAY 2

The macroeconomic effects of oil price shocks: Evidence from a statistical identification approach

Abstract

We analyze the dynamics in the global crude oil market based on a structural vector autoregressive model. We identify the model by presuming that reduced form residuals can be traced back to structural shocks that are independently distributed over the cross equation dimension. The resulting point estimates of the impulse response functions allow for a direct comparison with the outcomes of more conventional identification approaches. Our results are remarkably similar to the results regarding oil market dynamics in Kilian and Murphy (2012) and Inoue and Kilian (2013) even though they rely on statistical arguments instead of a set of theory-based a priori restrictions. Based on the results from our statistical approach, we investigate the cumulative contributions of different oil shocks on the rapid fall in oil prices at the end of 2008 and 2014, as well as the effects of different oil shocks on macroeconomic aggregates in the US, the euro area, and China.

JEL classification: C32, E31, E32, Q43.
Keywords: Vector autoregression, identification, global oil market.

This study is joint work with Helmut Herwartz.

ESSAY 3

Estimating fiscal policy reaction functions: The role of model specification

Abstract

The literature has not yet come to a consensus on the actual responses of fiscal policy to output and to past public debt levels within industrialized countries. While the cyclical adjustment literature has suggested a strong response of the primary surplus to the output gap, the time-series literature has tended to report a far smaller response. However, recent theoretical findings suggest that some of this difference may be due to the way in which the time-series literature has typically handled the issue of autocorrelation, in a way which is incompatible with the timing of automatic stabilizers. In order to find a way around this problem, we formulate and estimate a set of fiscal policy reaction functions for the euro area, which allow for the primary surplus to feature three components: a fast-moving (stabilizing) response to the output gap, a consolidating response to the debt-GDP ratio, and an exogenous, persistent fiscal policy shifter. When we formulate a fiscal reaction function in this way, our estimates are compatible in magnitude with previous estimates from the cyclical adjustment literature. Furthermore, based on a set of model comparison exercises in line with what has been done in the monetary policy literature, we argue that our specification explains the data better than does the more commonly used specification.

JEL classification: E62, H61, H62.
Key words: Fiscal reaction function, fiscal policy, autocorrelation, euro area, primary surplus, one-off operations.

This study is joint work with Claire Reicher.

ESSAY 4

Primary surplus and debt projections based on estimated fiscal reaction functions for euro area countries

Abstract

We project the path of the public debt and primary surpluses for a number of countries in the euro area under a fiscal rule based on a set of estimated fiscal policy reaction functions. Our fiscal rule represents a fiscal analogue to a well-known monetary policy rule, and it is calibrated using country-specific as well as euro area-wide parameter estimates. We then forecast the dynamics of the fiscal aggregates under different convergence, growth, and interest rate scenarios and investigate the implications of these scenarios in projecting the future path of fiscal aggregates. We argue that our forecasting methodology may be used to deliver insights into the medium-run effects of different fiscal policy rules and to provide some early warning of future fiscal pressures.

JEL classification: H62, H63, H68.
Key words: Fiscal rules, fiscal policy, euro area, forecasting.

This study is joint work with Claire Reicher.

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Eidesstattliche Erklärung

Ich erkläre hiermit an Eides Statt, dass ich meine Doktorarbeit "Essays in macroeconometrics" selbständig und ohne fremde Hilfe angefertigt habe und dass ich alle von anderen Autoren wörtlich übernommenen Stellen, wie auch die sich an die Gedanken anderer Autoren eng anlehnenden Ausführungen meiner Arbeit, besonders gekennzeichnet und die Quellen nach den mir angegebenen Richtlinien zitiert habe.
Ich versichere an Eides Statt, dass ich mich an keiner anderen Fakultät einer Doktorprüfung unterzogen habe.

Kiel, 23. Mai 2016

[Martin Plödt]